Comparison of MRI and CT for the detection of cerebellar (foramen magnum) herniation in Cavalier King Charles spaniels.

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Introduction

The Cavalier King Charles spaniel (CKCS) breed exhibits a high rate of Chiari-like malformation (CM). The latter is characterised by a disproportion of volume of the cerebellum and medulla oblongata compared to that of the caudal fossa. These abnormalities are associated with displacement or herniation of the most caudal areas of the cerebellum either into or through the foramen magnum (1,2). Several articles have suggested mid-sagittal magnetic resonance imaging (MRI) as the preferred technique for visualizing the caudal fossa and diagnosing CM (1,3,4). This study compares MRI and computed tomography (CT) for the detection of cerebellar herniation (CH).

Materials and Methods

Nine CKCSs were presented with a various range of neurological symptoms. MRI and CT studies of their brains and cranial cervical spines were performed as part of their clinical work-up with the dogs positioned in dorsal recumbency with the head in extended position. Using sagittal T1-and T2-weighted spin echo (T1WSE and T2WSE) MRI sequences and pre- and postcontrast CT-images, the cerebellar herniation length (HL) (= the position of the tip of the cerebellar vermis relative to the foramen magnum) was measured (mm) and assigned either a grade mild (≤ 2mm) or marked (>2mm) by 2 two observers. The results were analyzed statistically.

Results

There was a perfect agreement (k=1) for both observers for the detection of mild and marked CH for both techniques. However the Bland-Altman plot analyses of the HL indicated that CT and MRI findings did not agree well. The bias was significantly different from zero when comparing the HL measurements on the CT and MRI images. The limits of agreement for all measurements found the HL differed between techniques over a range of < 1,5 mm.

Discussion/Conclusion

The statistical analysis suggested that both techniques are useful for detecting CH. However because the bias was significantly different from zero, one of the methods consistently led to the determination of longer or shorter HL than the other method. For most comparisons, the HL was on average longer on CT. MRI provides greater soft tissue detail with no beam-hardening artifacts, which may improve the delineation of the cerebellum. Because HL does affect a diagnosis of CM, so CT can be used as a primary diagnostic tool for diagnosing CM in CKSs when MRI is not available.

References

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